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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A Bayesian Approach to Infer Nitrogen Loading Rates from Crop and Landuse Types Surrounding Private Wells in the Central Valley, California" *by* Katherine M. Ransom et al.

Anonymous Referee #1

Received and published: 20 March 2017

This study used nitrate measurements from many wells in the Central Valley, CA, to estimate nitrogen loading rate distributions for different crop and landuse types, using a Bayesian regression model. After reading the manuscript, I think the author should address the following major concerns. The author mentioned that they developed a novel Bayesian regression model, but since the whole manuscript lacks the introduction to previous statistical methods applied for N loading estimation and the reference of the application of Bayesian method related to the topic, it would be difficult for the reader to sense what the novelty is. The method section describes a lot about the site and data, leaving the statistical method vague and missing the implementation of the Bayesian

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method and the details (equations and descriptions) of the initial approximation and MCMC method for the posterior distributions. Overall, the manuscript is well-written except for a few results and conclusions not following the rigor of scientific standards (see specific comments). Moreover, some of the results (figures and tables) were not well organized or presented as pointed out in the specific comments below.

Specific comments:

The abstract is too general, and most of the contents seem to belong to the introduction section. Although the author claimed the development of the Bayesian regression model, the abstract did not emphasize the finding of this work using the model. And the focus of the work is clearly not the model development.

P2L8, "Drinking water with nitrate concentrations above background levels of near 1 mg/L ..." What are the 'background levels'? They were not mentioned before.

P2L19∼20, What is the source of these numbers? Any reference?

As the author mentioned they developed a novel Bayesian regression model, the introduction should describe the current research status of statistical methods used for the related topic, and whether the Bayesian method has been applied in this area. Otherwise, it is hard to tell what the scientific contribution is of this work.

P3L17, 'Spring 2011 depth to groundwater ...' meaning in the Spring of 2011?

P4L23∼24, how was the database filtered? why did you use median value, any reason for that?

P4L26, '4.4268', how to calculate this 'mass ratio'?

P4L29, 'ransom' –> random?

P5L10∼11, what are the soil properties that lead to the same behavior of pesticide and nitrate contamination? Or just simply because they are both hydrophilic?

P5L13, 'raster' –> raster image file?

P5L14, briefly introduce the data sources of CAML.

P5L34, why is '2.4 km'? How to calculate? And why is '0.30' m per year?

P6L13, 'occuring' –> occurring

P6L5∼17, has CVHM ever been fully tested for the research area? How accurate is this hydrologic model? Any reference?

P7L13, 'reflect' –> reflects

P7L9∼16, what are the 'location' and 'scale' parameters? Student t-distribution has only one parameter, the degree of freedom. Present the equation for the distribution here.

P8L5, '(1)' –> Figure 1?

P8L6, 'non-parametric Kruskal-Wallis test' should be described in the method section.

P8L25∼28, 'Pearson goodness-of-fit' and 'standardized Pearson goodness-of-fit' should also be described in the method section.

P9L1∼4, this sentence is too long and unclear.

P9L29, 'a' –> as

P9L31, 'are greater than', why is that? If you wrote something, then discuss it accordingly. Or do not mention it.

It should be better to put all comparisons with references in the discussion section, and no reference appears in the results section.

P10L16, what is the meaning to put the parenthesis and the statement about alfalfa here?

P11L13, missing the punctuation in the parenthesis.

P14L1, 'spatial correlation' does not appear in either results or discussion sections, how is it shown in the conclusion?

Figures

Fig. 1 was not referred throughout the entire manuscript.

Figs. 2, 3, 5, 6, and 7 need the legends.

Fig. 4, what are the x-axes?

Figs. 5 and 6, if data were not plotted in log scale, numbers in Tables 2 and 3 are repeated. Readers can receive the same information from the figures alone. Figs 5 and 6 can be combined as one. Figs 5, 6, and 7 are hard to read, suggest to change the style to bar plot, with landuse types on the x-axis and N loading on the y-axis.

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